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Lockers

The present invention relates to lockers, that is, storage cubicles, particularly, though not exclusively, arranged in rows.

A known type of locker comprises a cuboid body of five fixed panels which form two side walls, a back wall, a top and a bottom, and a hinged door which, when closed, forms the sixth face of the cuboid. The body and door of the locker are conventionally made out of panels of sheet metal. Such lockers are commonly stacked side-by-side in rows, with the doors all similarly aligned and facing the same direction. Lockers are found in many public or semi-public environments for people to temporarily or indefinitely keep their belongings in. As their name implies, lockers also commonly feature a locking means, typically a lock upon the door which engages with a keep formed in the body of the locker.

The door of such a locker is hinged using one or more hinge plates attached to the wall of the locker body and the door, the door being pivoted about its vertical edge.

The hinge of the locker is vulnerable to many types of damage, such as people carelessly over-opening the door, so that the part of the door presses the edge of the side wall of the locker, whereupon the some part of the hinge, or the door or body of the locker itself, may buckle and fail. Another type of strain put upon the locker hinges is caused by people who deliberately wish to cause damage to the locker by hanging upon the door, so that again the hinge or the door may become bucked or broken. The

locker is often targeted by thieves, who will apply force upon the key hole, or between the gap between the edge of the door and the locker walls.

The provision of such lockers in confined spaces, especially in narrow corridors, may also give rise to difficulties, as there must be enough space for the doors of the lockers to open whilst still allowing other people past the row of lockers.

US 5135293 and WO 8801143 both show a locker featuring a pivoted curved door, the pivoting point being inside the concavity of the curve. Whilst being opened, the door does not swing significantly towards the user of the locker, and the door is not as prone to damage as the cuboid locker.

The curved shape of the door used in these lockers result in some disadvantages over conventional lockers. When a curved door is fitted upon a generally cuboid locker, the curved door impinges upon the volume of the locker when the door is opened; this can be seen in the cuboid cubicles having curved doors shown in US 5651219. In a locker, this can result in the contents of the locker falling in the door's path when the locker is closed and jamming the door. Therefore, the shape of the body of the locker can be made to correspond to the curve of the locker, as in WO 8801143, and the bodies of the lockers arranged to attempt to waste as little space as possible, curved lockers being less efficient in that respect than cuboid lockers. US 5135293 attempts to minimise the problem of the contents of the locker barring the door's path by providing a door which is, when considered in cross section, approximately ¾ of a complete circle, and supplying shelves upon the door. There is though still a possibility that the lockers contents could fall from the shelves and jam the locker; further,

a large amount of space is wasted between the substantially cylindrical volumes which may be used for storage.

US 4783132 shows a double cylinder shaped cupboard, having two semi-cylindrical doors of similar curvature to the body of the cupboard. The interior of the cupboard is fully accessible. Both the interior and exterior are of an irregular shape, necessitating tailored shelving, and causing difficulty and inefficiency in fitting the cupboard in normal rectilinear surroundings. Also, the cupboard requires two doors and their mechanisms for a single compartment, resulting in further expense and maintenance.

The object of the present invention is to provide a locker which is easy and efficient to manufacture, is spatially efficient, and alleviates other problems of the prior art lockers.

According to the present invention there is provided A group of lockers, including at least first and second neighbouring lockers, at least the first locker including a body forming a compartment including compartment walls and an open side, and a door of generally uniform cross section and of uniform curvature, this curvature lying upon a circle, the door being supported such that the door may be rotated from a closed position in which the open side of the compartment is substantially covered by the door, to an open position in which the open side of the compartment is substantially uncovered, there being a cavity between neighbouring compartment walls of the first and second lockers respectively, the door's curve remains lying upon the same circle during rotation, and the cavity being capable of accommodating the door whilst it is in the open position.

Preferably the cavity, when considered from the front of the lockers, is covered by a covering member. Preferably the covering member includes a recess to accept the one edge of the door of the second locker.

According to another aspect of the invention, there is provided a locker or the like including compartment walls forming a substantially rectilinear compartment including an opening and a wall directly opposite that opening, and a door of generally uniform cross section and of uniform curvature, this curvature lying upon a circle, the door being rotatable from a closed position in which the open side of the compartment is substantially covered by the door and the door lies snug against a compartment wall when the door is in the open position.

Preferably the door is supported upon pivot means. The pivot means may be supplied by one or more generally segmental shapes pivoted about the apex of the segmental shape. Preferably a locking means to secure the door in the closed position acts upon the segmental shape. An extruded handle is provided on the door.

According to a further aspect of the invention, there is provided a group of lockers as herein defined.

Preferably there is provided a cavity between the bodies of at least first and second neighbouring lockers capable of accommodating the door of the first locker whilst it is in the closed position. Preferably the cavity, when considered from the front of the lockers, is covered by a covering member, which preferably includes a recess to accept the one edge of the door of the second locker.

It will be seen that a cuboid (or other non-cylindrical) volume may be provided behind a curved door, with almost no danger of any contents of the locker falling in the path of the door so as to jam the locker.

A locker and group of lockers embodying the invention will now be described, by way of example, with reference to the drawings of which;

Figure 1 is a plan view of two lockers,

Figures 2a and 2b are a side elevation and front elevation respectively of the locker, and

Figure 3 is a plan view of a locker in more detail,

Figure 4 is a plan view of another embodiment of a locker and portions of neighbouring lockers.

Referring to figures 1, 2a and 2b, each locker 10 comprises a cuboid body of five fixed planar rectangular surfaces which form two side walls 12,13, a back wall 15, a top 17 and a bottom 18, and curved door 20 of uniform cross section and curvature which is supported upon two hinge segments 25,26 which are pivoted about two pivot points on the body of the locker, an upper pivot point 28 on the locker's top, and a lower 29 on the locker's bottom. Referring to figures 2a and 2b, the top of the locker includes two spaced panels 32,33 and the bottom of the locker includes a panel 35 spaced from a plinth 36 which rests upon the ground. Between the spaced panels 32,33, and the panel 35 and plinth 36, the upper and lower hinge segments 25,26 are respectively accommodated.

The pivot point 28,29 of each hinge segment 25,26 is located at the centre of a circle upon which the door's curve lies. Thus when the door 20 is pivoted about these pivot points, it remains lying upon this circle as it is displaced. The pivot points, hinge segments and door are so arranged upon the body of the locker that the door may be swung between a closed position (as shown in the lower locker in figure 1) where it covers the open side of the locker and an open position where it permits full access to the open side of the locker (as shown in the upper locker in figure 1). The free edges of the side walls 12,13 of the locker (that is, two of the edges bounding the open side of the locker) lie somewhat inside the circle upon which the curve of the door 20 lies, and a chord joining the ends of the curve of the door is somewhat larger than the horizontal width of the open side. The door comes to a stop in its closed position when the side of the excised potion meets a buffer (not shown).

In order to open the door may be swung round about the pivot points, so that one edge of the door (that is, one end of the door's curve when considered in plan) comes to rest just before the side wall of the locker. For full access to the locker, the diameter of curvature of the door must be at least 1/2 the width of the locker, so that the door is not impeded by the side wall of the locker whilst the other side of the door continues to block the open side of the locker. The diameter of curvature should not be chosen to be any larger than is necessary to allow full access, since the extent to which the door extends to the side of the locker whilst being swung open should also be kept to a minimum.

The hinge segment 25 is a generally segmental shape, having a triangular portion 31 excised from one side. On the opposite side of the hinge segment a keep 33 is incorporated, the keep engaging with a lock 34

when the door 20 is its closed position. The hinge segment 25, and the weight of the door, are supported by a nylon glider 38 attached to the lower surface of the upper segment 25, and which slides across the lower panel 33 of the two spaced panels which house the hinge segment. The lower hinge segment 26 may be similarly provided with a nylon glider beneath it.

The upper and lower hinge segments 25,26 also ensure that the locker compartment is completely enclosed, and for this reason the excised portion 30 of the hinge segment must not be such that it allows any substantial gap between the front edges of the top and bottom 17,18 of the locker on the one hand and the top and bottom edges of the door 20 on the other. Alternatively, the top and bottom of the locker could be shaped so as to include a curved portion to cover these areas.

The door also includes a handle 38 set upon the door's outer face (that is, its convex side), close to the trailing edge of the door (that is to say it's the edge which trails hindmost along the door's curvature as the door is swung open). The handle is a shaped rib of constant cross section projecting perpendicularly from the door, and is conveniently an extruded plastics material. The handle runs vertically the whole height of the door, so that the door is convenient to open from a large range of heights. The door and handle may be extruded as a single, integral piece.

The lock 34 is operated by a proximity sensor upon the column member (which is described below). In use, keys operating such sensors (for example, by infra-red or ultrasound coded signals) may be kept by the users of the lockers (where the users are to have long term use of the lockers) or may be lent on a short term basis to the users on payment of a deposit (for example, at a gymnasium). The proximity sensor is shielded so

as to be protected against vandals or thieves. The lock and key is in any case so configured that damage to the proximity sensor will not result in the lock being disengaged. The location of the lock, at the top of the locker beneath the upper panel of the locker top means that most opportunistic thieves will be dissuaded from attempting unauthorised entry of the locker. The lock may be a mechanical lock, a motor driven bolt, or activated by a solenoid. A smart card could be used as a key, with a corresponding smartcard reader connected to the locker.

As shown in figure 1, a number of these lockers 10 are placed side by side in a row, set somewhat apart so that the each locker's door 20 may be accommodated in the space 21 between that locker and the neighbouring locker. A column member 40 is attached to one side of each locker to enclose the space between the lockers and its neighbour. The column member 40 presents a concave curve between a pair of lockers when one is considered as facing the lockers, and includes a vertical recess 42 to accommodate the trailing edge of the door of its own locker, and a gap 43 between itself and the next locker to permit that lockers door to swing past (these features being shown best in figure 3). The column member is of constant cross section.

The two lockers at the either end of the row are provided with column members of slightly different design, one column member requiring only the retaining groove 42 to accept the edge of the door, and the other column member requiring only the curved surface and gap 43 to cover the space occupied by the door in the open position. This space for the open door may be bounded by further panels, that is, a row end panel lying parallel to the lockers' side walls, and a panel extending in the same plane as the lockers' end panels. Alternatively, the lockers could be placed next

to one or more walls, the column member for the end locker being attached to the wall.

The column member includes the proximity sensor (not shown) by which the lock may be operated, and also an LED 45 embedded in the concavity of the column member which indicates when the lock is changing its state. The circuitry for the lock and sensor is located in the area bounded by the curved surface of the column member 40, a side wall 12 of one locker, and the curve of the door 20 (when in the closed position) of the neighbouring locker. This space, as well as other unutilised regions, such as the space bounded by the side wall of a locker and the curve of that same lockers door, and the remaining space between two side walls of neighbouring lockers, may be used to house other components, such as ventilation means (as described below), lighting means and the like.

On the side of the locker corresponding to the space where the open door is retained, the locker side has two excised regions 14 towards the front of the locker, these excised areas opening onto the regions between the locker top's spaced panels 32,33 and the locker bottom's plinth 36 and panel 35. These excised regions allow the top and bottom hinge segments 25,26 to swing over to the side of the locker as the door 20 is opened.

Along the back of the row of lockers, rear covering panels are attached to the locker backs, these panels lying in the plane of the lockers' backs, so as to cover the door retaining spaces when viewed facing the lockers' backs. Top covering panels lying in the plane of the lockers' tops similarly cover the door retaining spaces when viewed facing the lockers' tops. The rear covering panels and the panels making up the lockers' back 15 could be replaced by a single, integral panel. Similarly, the top covering

panels and the upper panels 32 of the top spaced panels could be replaced by a single, integral panel.

It will be seen that in contrast to the lock, keep, and hinge of a prior art locker, the pivoting and locking means of the present locker are largely inaccessible, whether the door is opened or closed, thus cutting down the scope of damage which may be performed by vandals. Furthermore, no leverage can be brought to bear upon the door or the pivoting means.

The door of the present locker, in opening to one side of the compartment, allows lockers to be positioned in locations in which a locker having a conventionally pivoted door would be unacceptably cumbersome and restrictive.

Referring now to figure 4, in a modification of the locker the back of the locker 10' comprises two curved members 50,51 and a grating 53, each of which extend through the full height of the locker. The grating is planar rectangular shape, and lies perpendicular to the locker's side walls. Each curved member 50,51 includes retaining groove 55 which accepts the thickness of the sides walls so that each side wall 12,13 is joined to a curved member. The two curved members are similarly attached using grooves 56 to either side of the grate 53, securing it in place. The curved members thus, when considered in plan, 'round off' the rear corners of the previous embodiment of the locker 10.

A single, integral, panel 57 is erected to the rear of the row of lockers, so as to shield both the gratings 53 and the door retaining spaces 21'. The gratings 53 provide the lockers 10' with ventilation so that air in an individual locker does not become stale, as might occur for example

when the locker is used to store clothes. The ventilation may be enhanced by providing a fan system associated with the row of lockers, the unannotated arrows illustrating such a possible airflow.

Figures 2a and 2b also illustrates various components which may be included in the lockers, such as a grated towel shelf 60, a grated bag shelf 62, a glove box 64, and a coat hook 65. Naturally, many diverse elements or accessories could be included in such a locker.

Many of the parts of the locker may conveniently be extruded, since the have a uniform cross section. As well as the simple planar rectangular top panels 32,33, bottom panel 35, back 15 and walls 12,13 of the locker 10, the door 20, handle 38, column member 40, and curved back portions 51 of the embodiments shown herein could all be extruded, though naturally, they could be manufactured by other techniques.

Various materials could be used, most ideally for extrusion purposes including plastic, laminated or otherwise toughened glass, and aluminium.

The dimensions of the locker will be dependent upon its intended use. For a locker for use in a gymnasium for example, the locker could be between about 250 mm to 400 mm wide, about 600 mm wide, and about 1.8 meters high. Smaller lockers, for example for person effects and stationary for use in schools and offices, overhead lockers in trains and planes, or for apartment letter boxes, could be of the order of 250 mm cubed. Lockers of this size could be stacked one row on top of another. The lockers could of course be oriented so that the door pivots about a non-horizontal axis.

The same principle could also be applied to other types of compartment where a door is required with equal benefit, such as domestic cupboards and office filing cabinets, and even changing rooms and other cubicles.